ON SCENE

THE NATIONAL MARITIME SAR REVIEW

DEPARTMENT OF TRANSPORTATION

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DISTRESS BROADCAST OR URGENT BROADCAST (Cont.)

In Issue 5-77 we printed an item on when to use a distress broadcast and when to use an urgent broadcast. It has been called to our attention as a result that something should be said about the cancellation of such broadcasts. The broadcasts serve to alert mariners that something is wrong. All too often, after the case is closed or suspended, we fail to de-alert the maritime community. A cancellation broadcast should be used but it should contain more information than just the cancellation. Mariners are traditionally interested in the fate of fellow seafarers who have been reported in trouble. Accordingly, the cancellation broadcast should contain some information as to the status of the case, such as, "All survivors were rescued." or "Two men remain missing." or Active search for _____ has been suspended. However, mariners are requested to keep a sharp lookout when transitting the area." etc.

Correction: In the 6-77 issue of ON SCENE we referred to the wrong COMDTNOTE in the article concerning the FAA's Track Analysis Program (TAP). COMDTNOTE 16131 of February 1977 originally described the program, but the latest information and the new label, TAP, was contained in COMDTNOTE 16131 of 16 August 1977.

DO IT NOW....

SIT DOWN and WRITE OUT THAT SUGGESTION YOU'VE BEEN THINKING ABOUT.

ON SCENE is a SAR publication published by the Commandant, U. S. Coast Guard as a source of information concerning current and proposed procedures as well as new developments in SAR. Articles contained herein are non-record and non-directive.

TATTLE TALES

By Steve Roush, Ocean Engineering Div., USCG

Editor's Note: *The author prepared this detailed guidance on tow line stretch gauges (Tattle Tales) because of his concern about some other guidance which is making the rounds and which is erroneous.*

All of us have probably heard horror stories of a cleat pulling out or a tow line breaking while the vessel is under tow, they're no doubt true. Some synthetic lines, those that exhibit high stretch, can release high amounts of energy during such a failure. A one-inch diameter double-braided nylon line, 100 feet long releases 245,000 foot-pounds of energy at break. This energy is about the same as the energy in a Ford Maverick at 63 miles per hour. Since the Coast Guard cannot go to every week-end sailor and inspect his cleats every year the best way to reduce the chances of having an accident is to (1) be sure when towing that the tow line is made fast to a sustantial structural member on the boat (a properly installed cleat may satisfy this requirement), (2) reduce the load on the line; and (3) keep your tow lines in good condition.

The load on the line can best be determine with a tattle tale. A tattle tale is a small slack line of a premeasured length attached to the tow line at a predetermined length such that when there is no load on the tow line the tattle tale hangs slack. When the small line becomes taut, the large line has reached its working load. To make a tattle tale for your tow line you need only four items: a tape measure, a marking pen, a length of small line, and some tape (such as electrician's tape).

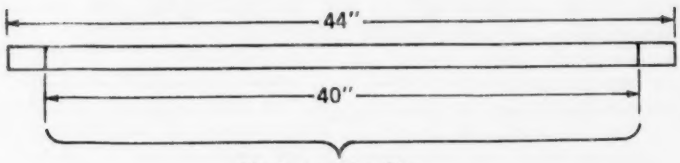
The most important thing to know in constructing your tattle tale is the kind of tow line you have. It's also important to know whether the tow line is new, since a tattle tale should not be used on new lines. One moderate pull on a new line constitutes use. Tattle tales should not be placed on new line until after a good strain has been taken and released. Nor should they be used on that portion of a new line which remained on the reel when the strain was taken unless it too has later been placed under strain and released.

To construct a tattle tale you first acquire a small diameter line about 44" in length. Because manila shrinks with time, it is recommended that only synthetic small stuff be used. Secondly you draw the line hand tight, measure off 40" leaving 2" on both ends. You then mark the 40" positions with your marking pen (See Figure 1). These marks indicate where the tape shall extend. Next you tape one end of the tattle tale to the tow line where it can be easily seen by the coxswain and will come under tension while towing. Be sure the tape just comes up to the mark on the tattle tale. Now measure off along the tow line the distance listed in Table 1 under "Normal Tow Line Length" for your tow line. This distance is measured from the aft piece of tape (directly above the tattle tale mark). The tow line should be nearly slack when this measurement is made (pull it hand tight to "set" the braid or twist). Once you have determined the distance on the tow line the second tattle tale mark should be placed at that point and taped to the tattle tale's end (See Figure 2). A permanent attachment can be made by serving the tattle tale into the tow line. In Table 1 the "Normal Tow Line Length" is the distance between the tapes as measured on the tow line. When the 40" tattle tale has stretched taut, the tow line will be under a strain of 30% of its rated wet used break strength. Also in Table 1 is a column entitled "Max Tow Line Length", this length of tow line between the tapes should only be used in cases where everything else has been tried but the object you're trying to tow just won't budge (first try larger size lines and doubling-up, etc.). When the tattle tale comes up tight in this distance you have just loaded the tow line to 50% of its rated break strength and have probably started to damage some of the internal fibers. For safety reasons a line that has been used to this extent should be removed from service. In work conducted aboard the CGC FIR it was found that at forces near and above 60% of the rated

Table 1

Tow Line	Normal Tow Line Length	Max Tow Line Length
3-strand polyester	37.50"	36.75"
8-strand plaited polyester	36.75"	34.75"
2-in-1 braided polyester	37.25"	36.25"
3-strand nylon	34.00"	33.00"
8-strand plaited nylon	34.75"	32.50"
2-in-1 braided nylon	35.50"	34.00"
2-in-1 braided nylon-polyester	36.00"	34.75"

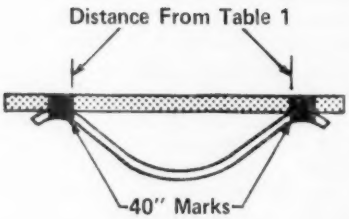
Figure 1

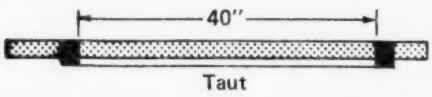


Mark the Line Here

Any Small Diameter Synthetic
Line Such as 9 thread

Figure 2





break strength, the bending radius of the cleat or bollard and any knots in the line (including bowlines etc at the end) become critical. A bowline was observed to fail in the 60% of rated break strength range. For these reasons the "Max Tow Line Length" tattle tale should only be used as a last resort when there is no other alternative but to put such heavy strains on the line. The values in Table 1 are based on safety factors of 5 for normal work and 2 for maximum loads. The breakstrength used in the calculation was that of a wet used rope and not the manufacturer's advertised dry new rope.

COMMENTS AND OPINIONS FOLLOWING A VISIT TO A SAR STATION

By First Distrct SAR Training Team

My impression of the SAR readiness of this unit's boat crews illustrates a severe problem that is in no way unique to this station. Specifically, training is entirely of an "on the job" nature, conducted by junior and relatively inexperienced petty officers. Training consists of "Monkey-see,-Monkey-do" until a crewman can perform those few skills required to complete a routine mission. The nature of the area and case load is such that the vast majority of assistance missions are repetition of the same case over and over again; a tow is picked-up in the same basic area of high boating activity, and delivered to the same marina. Those seamanship skills that are not a part of this daily drill are ignored and forgotten. A man who has mastered what little has to be mastered to fit into the station routine (as coxswain, engineer or seaman) is said to be qualified."

PO2's and PO3's cannot be left alone to conduct training, as they will train for what they conceive their mission to be. We must realize that difficult and challenging missions, at night, in heavy seas, or working in against a lee-shore in high winds, just do not occur on a regular basis. Consider that at a unit such as this station, where the boats get underway for actual SAR and actual SAR only, a man in one duty section going on every single mission (which would be exceptionally rare indeed) would be underway not more than 100 or so times in a year, and would see basically one mission repeated again and again as mentioned above. Clearly, this is not te way to run a SAR organization!

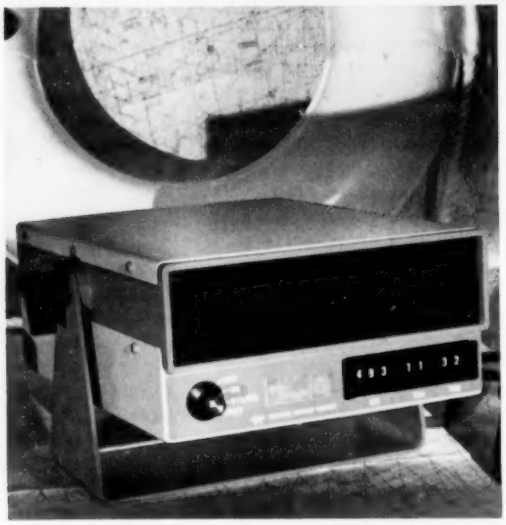
I am of the opinion that the principal function of an OIC or senior petty officer is to give the benefit of his experience to his subordinates. This can only be done underway. At a station, junior PO's are being asked to operate their boats and train their crews without this training they deserve.

Additionally, our experiences at a station were such to give us the impression that training during the working day is considered "slacking off". The attitude that a man is required to seek instruction during his leisure hours is far too prevalent at this unit, and, unfortunately, at any others. Consequently, crewmen at a station are sadly lacking in very basic skills: marlinspike seamanship, operation of electronic equipment, etc.

Lacking daily instruction, crewmen become disinterested and alienated from their superiors. Faced with challenges that they have not been prepared to meet, they do their best, and thankfully, they usually manage to complete their mission by virtue of their own inventiveness and common sense. The stage is set, however, for a few more boat crews to learn by bitter experience, at a cost to the Coast Guard in terms of missions fumbled and equipment damaged. I strongly assert the need for an underway training program at the stations, conducted by knowledgable senior petty officers under all conditions including night and heavy-weather operations, with the emphasis on basic seamanship skills, casualty control, and accident prevention through anticipation of problems before they arise.

MORE ABOUT LORAN-C USE FOR SAR

SEARCHES USING LORAN-C
By CAPT W. R. FEARN, USCG



Several changes in the navigational capability of Coast Guard search vehicles generally will be forthcoming in the relatively near future. Nearest is the installation of the TDL-708 LORAN-C Receiver on most of our floating units. The next will probably be the adoption of the TDL-424 LORAN Navigator for use on HH-52 helicopters. This equipment has been flight tested and evaluated by Air Station Cape May and the National Aviation Facilities Experimental Center (NAFEC). The tests covered use of the Navigator in searches and in the civil aviation environment. Last will likely be provisions of LORAN Assist Devices (LADs) to at least some of the Coast Guard floating units. I anticipate this final increase in capability to be realized within 5 years.

Accepting the presence, present and future, of these receivers and devices, it seems appropriate to examine the accuracy of navigation they will afford. Also, we should consider whether changes in the way in which we prescribe searches are necessary to enable the search vehicles to realize those accuracies.

The National Search and Rescue Manual says of search vehicle navigation:

"Accurate navigation is essential throughout a SAR mission for both search pattern flying and for reporting exact position of survivors when found. Larger aircraft have a greater capability for accurate navigation than light aircraft. For searches over isolated or oceanic areas, sophisticated navigation equipment is essential." And it also says:

"Accurate navigation is essential throughout the SAR Mission for surface craft as well as for aircraft. Again, the larger the vessel the better will be its navigational capability. Navigational accuracy of vessels is considered to be within 5 miles in oceanic areas. Sophisticated navigation equipment may improve this to less than a mile. Small boats are usually limited to a minimum of navigation equipment and are generally considered to have navigation accuracy within 15 miles."

LORAN receivers and LADs will, in fact, give to our search vehicles the sophistication to enable them to navigate during searches to accuracies of 50 feet to 300 yards. Such capability will result in significant savings of time and fuel while achieving the desired results. This enhancement of search accomplishment was amply demonstrated by the TDL-424 LORAN Navigator tests. An HH-52 performing a Creeping Line Search using VOR/DME for control obtained a calculated POD of 68.4% (average of two flights) on first search. When using the LORAN Navigator, it achieved 77.3% POD on first search (average of five flights). It was further calculated that 1.5 searches using VOR/DME control would be needed to achieve the desired 78% POD while only 1.04 searches would be needed under LORAN Navigator control to reach the same goal.

LORAN ACCURACIES

The accuracy of the LORAN-C system is a complex subject and I will not even try

to explain it here. Rather I will select certain parts of the subject which are pertinent.

We can accept that the LORAN-C transmissions provide families of hyperbolic lines of position which hold their positions over the earth's surface with a high degree of stability.

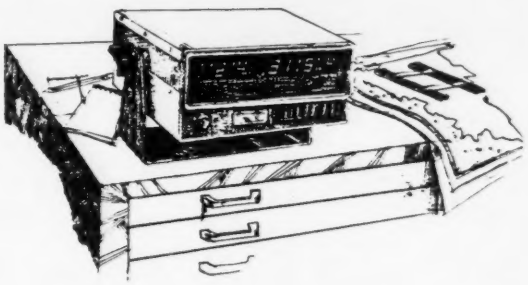
When these transmissions are available in sufficient strength to a receiver designed to work as part of the system, the readings obtained from the receiver can be converted to geographical position to within ¼ nautical mile 95% of the time. In areas of best crossing angles, best time difference gradients and highest signal strength, the accuracy may be 150 yards. The conversion is based on plane and spherical geometry and radio propagation constants. This accuracy is termed "Predictable Accuracy". It is the accuracy with which our search vehicle could go to a datum defined in LAT-LONG.

Again assuming our signals and receiver are as above, we need to understand another aspect of LORAN-C accuracy, "Repeatable Accuracy". Repeatable accuracy is the accuracy with which our vehicle can return to a position in the hyperbolic grid as defined by reception of the signals forming that grid. It is also the accuracy of our position in the grid relative to another part of the grid in the near vicinity. It is related to our receiver only and to the grid only. In terms of our searches it is how accurately we can hold to a single LORAN LOP, or how accurately we can return to a place where we have been before and have identified using our receiver or LAD. In general, we can hold to a line of constant time difference to within 50-150 feet in good signal areas and to within 300 feet at the receiver's operational limit. Since returning to a position involves the use of two LOPs, the repeatable accuracy in this case is about 200 yards in good signal areas.

A final type of accuracy is "Rendezvous Accuracy". It is the accuracy with which your receiver can bring you to the position occupied by another receiver and defined by the readings of that other receiver. It is the accuracy of going to a datum sent in by a LORAN-C equipped fishing boat in LORAN-C time difference form taken directly from his receiver. Or it is going to his datum expressed in LAT-LONG taken from his LAD using your LAD. "Rendezvous Accuracy" of LORAN-C is better than its repeatable accuracy but, for the purposes of this paper, we will say both accuracies are the same.

THE RECEIVER

Again assuming the presence of signals and proper design of the receiver, the accuracy of navigation is going to be determined by the readout of the receiver. The TDL-708 receiver presents two time differences simultaneously, each reading out to 0.1 microseconds.



Signal to noise ratio at the receiver determines the stability of the readings when the receiver is stationary. In poor signal to noise areas, the change in readings due to vehicle motion may be masked by instability. The navigator must have some experience in visually averaging readings to achieve the smoothing over and above the smoothing (time constants) built into the receiver.

The distance over which the receiver must travel to effect a change of time difference readout of 0.1 microsecond also varies, due to the geometry of the hyperbola. This distance per unit of time difference change is called the gradient and is measured perpendicular to the hyperbola. On the baseline which connects the two transmitter locations, 0.1 microseconds of time difference (TD) changes is about 16 yards. The gradient increases as the receiver

moves away from the baseline and also as it moves to the regions of the baseline extended beyond each transmitting station where the gradient approaches infinity and its change is non-linear.

THE LORAN ASSIST DEVICE (LAD)

An LAD is actually a computer which accepts present position in time difference from a LORAN-C receiver. Its program computes from present position, from stored constants of transmitting station location, spheroid and propagation and from destination insertions. The readouts are generally:

- Present position in LAT-LONG, and course and distance to destination.
- Some may also present steering orders by means of needles or lights.

A LORAN navigator device is an LAD with an integral receiver and generally with much greater capability.

The Coast Guard field experience has been with one LAD produced as an engineering test device by Applied Physics Laboratory (APL). It had the following features:

a. Inputs:

- Present position from receiver
- Desired course to destination
- One destination in TD format
- Various lane widths centered around desired course.

b. Readouts:

- Course to destination to 0.1 degrees.
- Distance in yards to destination to 10.0 yards to 50 miles, to 100.0 yards to 500 miles.
- Steer right-left lights lit when present position is outside of lane.

The Service will soon test several other LADs of which the author is only familiar with the Austron product which will be used as the example for this paper, the APL device being retired from field use. The features of the Austron LAD are:

a. Inputs:

- Present position from the receiver (planned to be the TDL-708)
- Ten destinations in either LAT-LONG or TD format.

b. Readouts:

- Course to destination selected to 0.1 degrees.
- Distance to selected destination in yards from 0 to 1 mile and to 0.1 miles beyond 1 mile.
- Present position in either LAT-LONG or TD format.

One particularly important fact about the Austron LAD is that all TD format insertions are converted to LAT-LONG before use.

The Austron LAD nas no lane feature. The navigating operator must either plot positions frequently to see his deviation from desired track or he must estimate the deviation using the "Radian Rule". For our purposes, this rule can be stated: The cross-track error equivalent to 1 degree of error from desired course to destination is approximately 1/60th of the range to destination. For example at 12000 yards, 1 degree of course error is about 200 yards of cross track error.

Now that we have examined the two devices with which the surface search vehicles may be equipped, we will consider the use of those devices in searching. The reference will be Chapter 8 of the National Search and Rescue Manual. Only single unit searches will be treated. Multiple unit searches are of course practicable if adjacent units are similarly equipped in which case the accuracy of the track of each unit relative to that of the other unit would in effect be rendezvous accuracy.

VEHICLES WITH RECEIVERS ONLY

The Parallel Track Single-Unit LORAN Line (PSL) Search is the only search in which the inherent accuracy of LORAN-C will significantly enhance track keeping. In all other searches, the receiver equipped vehicle will have to convert TD information to position by means of charts with the results of inaccuracy and delay.

To realize the accuracy of LORAN-C, we must provide search definition in time difference form. The search planner needs to know the gradient for each LOP and the azimuth for each LOP at the center of each search area. There is a computer program available which gives this information. It could be used in the CASP (Computer Assisted Search Planning) program. The search planner would have to have some knowledge of LORAN-C primary service areas so that he would define his search using the best LORAN triad of transmitting stations for the search area. The message from the search planner should not merely specify a PSL search in an assigned area. The search message should specify area, LORAN pair defining the search legs and the time difference between search legs, the axis of the search which will be the course of the crosslegs and the limits of the time differences of the other LORAN pair bounding the search area. A search message of any other form, LAT-LONG or area, will require chart conversion, degrading accuracy.

The only major difference between search geometry of the PSL and other parallel searches is that the PSL will generally result in a parallelogram of search area boundaries. The PSL single search will probably not be easily accommodated to a trackline requirement because the orientation of LOPs will generally not agree with the desired axis of search. However, several PSL search areas could be defined to generally cover the trackline search corridor.

One other point is that safety of adjacent search vehicles from collision would be enhanced by specifying time difference danger limits. However, this factor is of less import for the surface vehicle than for aircraft.

VEHICLES WITH LAD

As explained above, an LAD must be accompanied with a receiver. Thus, the foregoing discussion of the PSL search is also applicable to the LAD-equipped vehicle.

Trackline searches and creeping line searches are easily performed using an LAD. Parallel track searches with straight line segments are also. Because a remote destination can be inserted into an LAD and range and bearing (course to destination) are outputs of the LAD, both Parallel Single-Unit Arc (PSA) and Parallel Single-Unit Circle (PSC) become feasible. The searching unit has only to lay out the desired search using the remote destinaton and plot the range and bearing every two or three minutes. Practical guidance for a PSA search could be obtained by sailing within a certain range band and between certain bearings on each leg; straight line segments approximating the desired legs would result. Similarly, practical guidance for the PSC search would be obtained by sailing constant range contours.

Sector searches are also particularly simple with an LAD. The datum of the search is inserted as the destination. Course readouts are always to or from. Range readout determines the length of each leg. Constant range can provide guidance during circumferential legs.

Track keeping using the Austron LAD can be achieved by plotting range and bearing every two or three minutes. Generally, an expanded scale can be achieved by laying out on a sheet of paper rather than using a chart. Of course, true north orientation is necessary. Track keeping estimation is possible using the "Radian Rule" while sailing to or from a destination. In the PSA and PSC searches, the range readout provides track keeping automatically.

RESULTING SEARCH NAVIGATION ACCURACIES

Neither a receiver-equipped nor an LAD-equipped vehicle will be able to occupy a datum to any greater accuracy than that to which the datum is known except when datum is defined by the distressed vehicle's LORAN-C receiver or LAD. In the latter case, rendezvous accuracy will be achieved.

Commence Search Points (CSPs) derived from charted time difference lines or charted LAT-LONG positions can only be occupied with the predictable accuracy of LORAN-C. Once a search vehicle has been to a CSP thus defined, it will be able to return to that CSP with LORAN-C's repeatable accuracy. Further, all subsequent positions in the search will be related to that CSP with repeatable accuracy.

Track keeping accuracy of a receiver-equipped vehicle following a line of constant time difference is very high, 50-150 feet. Thus parallel track single-unit LORAN (PSL) searches are potentially capable of giving the highest probability of detection.

The track keeping accuracy of an LAD-equipped vehicle is less, probably 100-300 feet when a good plot is kept thereby providing additional smoothing of data, but the flexibility of the LAD as to use in navigation and guidance give the surface vehicle the equivalent of a VOR/DME system but with the LORAN-C repeatable accuracies.

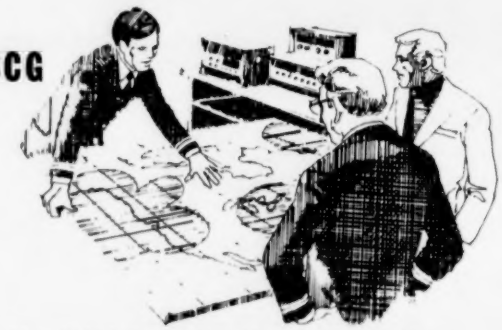
CONCLUSION

LORAN-C receivers and LORAN Assist Devices will give search vehicles greater navigational capability. The accuracy of navigation will be significantly enhanced, resulting in higher probabilities of detection at lower cost in fuel and time.

But to realize these gains, the search planners must understand the equipments installed. They must plan searches to enable the search vehicle's navigator to use his equipment in the most logical and accurate fashion.

Editor's Note: *Information from the Electronics Engineering Division reveals that current planning calls for a field evaluation of at least three Loran C devices. In addition to the Austron Model 630 LAD now on CGC TAMAROA, a Micro-Logic Model ML 300 navigation computer and an Epsco Model 4060 plotter are being procured. These will be provided to two other ships in addition to TAMAROA. The three ships selected will rotate devices so that each of them can make a comparative evaluation over a period of time. A possibility exists that additional devices coming on the market will be included. It is planned that the evaluation will be completed by the end of the summer of 1979. All of this should lead to selection of future equipment for Coast Guard cutters.*

A SAR SCHOOL COMMENT
By CDR B. G. Cunningham, USCG



A very concerned but honest student while attending the National Search and Rescue School's class on search patterns observed that the most common search pattern used in his area was not the conventional PS, CS, VS, etc. but the HS - HELTER SKELTER pattern. I imagine there are a lot of HS searches conducted by both surface vessels and aircraft that have limited navigational capabilities. Anyone who has ever attempted to navigate a search pattern offshore with limited navigational capabilities can truly appreciate the advantages of an easy-to-use navigational device. The Coast Guard has purchased for installation on all WPB's, WMEC's, WHEC's and some aircraft Teledyne 708 LORAN C Receivers. A similar receiver has been procured by the 13th District for installation on all their 44 foot vessels. Within two years LORAN C coverage will be expanded on the East and Gulf Coasts of the United States which will allow easy-to-use yet fantastically accurate navigation. This coverage and the wide spread availability of LORAN C navigational devices will have two quite dramatic affects on the total SAR system; one occurs during the initial action the other in the planning stage. After the SAR mission coordinator (RCC Controller, Group OOD, Air Station Duty Officer) becomes aware of the SAR case it then progresses to the Initial Action stage. It is during this stage that most of our cases in the Coast Guard are won. Or lost. Based on the information received by detective work on the part of the controller, existing weather conditions, controller's experience and other factors he directs search and rescue units on the scene. The SRU is then expected to conduct a search within the confines of the designated area. The controller has hopefully selected an area in which the target is located. I venture to say - he has.

Coverage factor (C) is a measurement of search quality. It is found by dividing the corrected sweep width (W) of the target by track spacing (S) of the search unit. The Probability of Detection (POD) curve translates coverage factor into a meaningful measurement of search results (POD). A little known fact about the curve used in the National SAR Manual is that its validity depends on one very important assumption - the legs of the search are parallel not helter skelter. One way in which the LORAN C Receiver may be used in coastal waters within a station's area of responsibility is to establish a series of pre-planned areas (grids). This concept is currently in use in several areas. When the LORAN C Receivers become available it will be a simple matter to construct the grids based on LORAN C coverage rather than the conventional North, South - East, West orientation. The grids should have at least two different orientations to allow for the effects of target drift, sun angle, etc. and have several pre-planned track spacings to allow for various target sizes. This will allow the coxswain or pilot to be able to accurately navigate a pre-planned area and respond to a distress situation without using valuable time transcribing areas to his chart, plotting courses etc.

If initial actions are unsuccessful or SRU availability or weather conditions preclude an initial effort, however, then it is time to start planning the next day's (or night's) search. Search radius is a function of the total probable error of position (E) and safety factor (fs) corresponding to the planned search number, i.e. first planned search = 1.1, second - 1.6 etc. and R = E x fs. E is a function of initial error of position (X) search craft navigation error (Y) and the drift error (De). Therefore if a small vessel was in distress (navigation error = 15 miles) and the area is to be searched by a unit having poor navigational capabilities (15 miles) and drift distance was negligible then the total search area will be 2,304 sq. miles. That's a lot of ocean. However, if the initial position was given by LORAN C lines and the SRU used LORAN C to navigate the total navigational errors (rendezvous accuracy) could be less than one mile. If the drift errors remain negligible the planned search area will then be 16 sq. miles. Quite a difference.

As Captain FEARN states in his paper, LORAN C Receivers and LORAN assisted devices will give search vehicles greater navigational capabilities than ever before achieved, which will result in higher probabilities of detection. In addition, because of the greater navigational accuracy on the part of the search unit, the area to be searched will be greatly reduced.

MOTOR LIFE BOAT LORAN-C OPERATIONS
A Report from Commander, Thirteenth Coast Guard District

The recent installation of LORAN-C receivers, Internav 204's with a remote readout unit on 13 CGD's fleet of MLBs made a marked improvement in overall capability of the resource. In an effort to quantify the effect of this equipment a survey of user reaction and acceptance of the equipment was conducted. The following is an abstract of the survey questions and the concensus of responses:

QUESTIONS AND ANSWERS

a. Question. What has been the degree of operational use of these receivers?

Response. The receivers are used on all underway missions to varying degrees. Virtually all of the MLBs use this equipment during all off-shore SAR cases. All night cases and SAR cases in reduced visibility. One impediment to use, on a boat such as the MLB, is the difficulty in handling charts. Most vessels in distress report their position in LORAN-A coordinates. With the LORAN-A time differences (TDs) on one side of the

chart and the LORAN-C TDs on the other, it is extremely difficult to correlate the two.

b. Question. What has been the operator acceptance at each station?

Response. Operator acceptance has been good to excellent. With increased operator training and development of improved operating techniques we expect operator acceptance to be outstanding in all cases. Use of charts in plotting LORAN-C TDs is a serious drawback to acceptance of the LORAN-C system. Large scale plastic coated charts are being provided in some cases. These will be used by the coxswain while at the helm.

c. Question. What has been the reliability of these receivers?

Response. Excellent in all respects, however, it should be kept in mind that we have had a relatively short period in which to develop a realistic mean time between failures.

d. Question. What has been the experienced LORAN-C coverage?

Response. Good coverage in all areas.

e. Question. What has been the observed accuracy?

Response. Within a ¼ mile fix accuracy is generally reported. Considered excellent.

f. Question. What has been the percentage of cases that required the use of LORAN-C for efficient SAR mission accomplishment?

Response. Estimates vary from 25% to 75%; however, at night and in poor visibility these estimates approach 100%. We expect this figure to increase with additional operator training and experience.

g. Question. Have any operational techniques been developed that are based on the use of LORAN-C receivers?

Response. Other than the normal fix capability, the boats on occasion, feed back time delays to their stations, which in turn plot the fix and then vector the boat to the destination. The repeatable accuracy of the system is routinely used, for instance, during a search if the operator sights an object of interest he immediately punches the hold button, records the reading, and then back tracks to the area of the sighting. This feature is particuarly useful during periods of limited visibility.

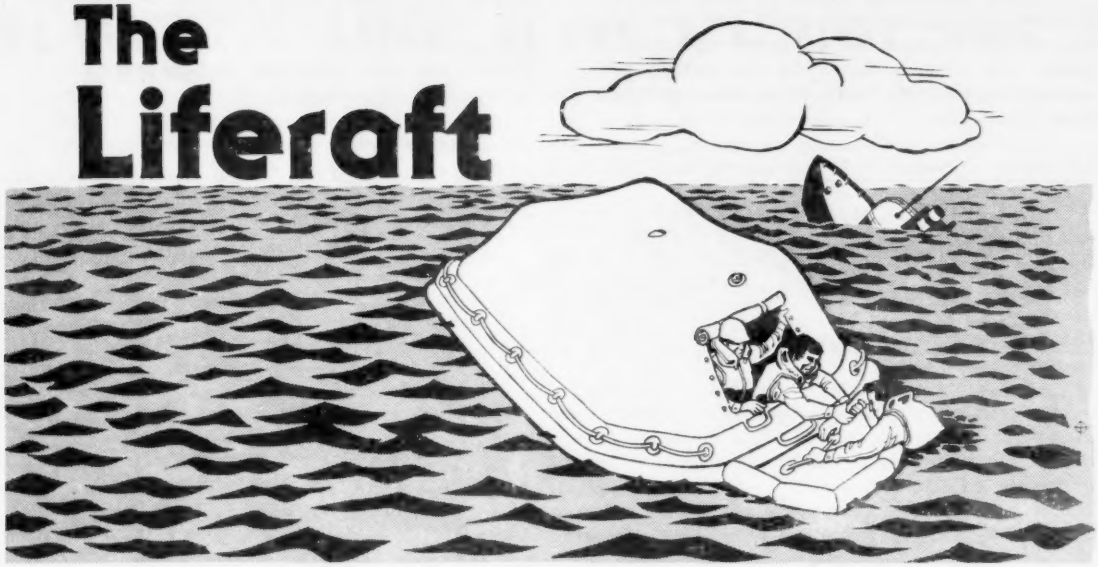
h. Question. What considerations are given to the dispatch of a LORAN-C equipped boat vice a non-equipped boat?

Response. For those stations having 44' MLBs only, there is no decision since all these boats are LORAN equipped. On those stations having a mix of 52' MLBs, 44' MLBs, or 41' UTBs, the decision must be weighed depending on the circumstances, that is, weather, distance, off-shore, urgency of distress, etc. As a general rule, though, a 44' MLB will be dispatched on cases requiring good navigational accuracy.

SUMMARY

To recap the program, the inclusion of the receivers in the 44' MLB has generally been hailed by 13 CGD field units as the greatest single electronic, operational improvement to the boats in the recent past. As a result, we anticipate a significant reduction in the average sortie time for off-shore cases. This factor, among other things, makes additional resource hours available for our continually expanding missions. Regarding future plans, we will continue to pursue timely installation of LORAN-C receivers on all major SAR/LE/ATON response units: H-52s, 41' UTBs, 52' MLBs, WPBs, WLIs, WLMs. Further, we hope to develop a comprehensive LORAN-C Operator training program, along with methods of operation tailored to more efficient task completion in our vaious mission areas.

The Liferaft



WILL-POWER

A most important factor in survival.

A strong will-to-live overcomes deficiencies in equipment; a weak will may be fatal, even when all other circumstances are favourable to survival.

Liferaft. North Atlantic.

A forty hours ordeal, "There were seven of us on the raft but the Third Officer died about two hours before we were picked up. He was very despondent and toward the end he lost heart and gave up and died."

Liferaft. Doldrums (Atlantic)

Third day, Kenneth Cooke reported "There and then I vowed that come what might, I would hold on to life with every fragment of tenacity I owned in my being. 'Hold on' I whispered to myself. 'Whatever happens and however low you may feel, just hold on. Hold on!'. The ordeal lasted fifty days, Kenneth Cooke and one companion survived, twelve others perished'".

Lifeboat. North Atlantic.

"After four days in the boat the Carpenter died. He had not been injured but he was an elderly man and I think he became too dispirited to put up a fight, and just passed away very quietly".

Lifeboat. North Atlantic.

Thirteen men in boat for eleven days "On the last night the Third Operator showed signs of being delirious, in fact one or two others were beginning to ramble in their speech. I think that this was mental effect caused by cold and exhaustion. I began to feel dispirited and despondent myself and the will to survive became weaker as the days went by".

Lifeboat. North Atlantic.

An eighteen days' ordeal. "All the men remained fit for the first ten days, but on the fourteenth day the Second Cook died, not through lack of food or water, but, I feel sure, because he did not have the will-to-live".

Liferaft. Indian Ocean.

20th day Ensio Tiira "I done my best to make the water last until the next rain, but it was beyond the capacity of my will power now to have water in the bottle and not drink it. My resistance was breaking down".

Lifeboat. North Atlantic.

A twenty one days' ordeal. Fifteen men died. "I think a number of the men became dispirited and despondent and seemed to me they lost the will to live".

Lifeboat. Indian Ocean.

A twenty eight days' ordeal. "On the nineteenth day Ordinary Seaman_____showed signs of weakening and was losing heart,

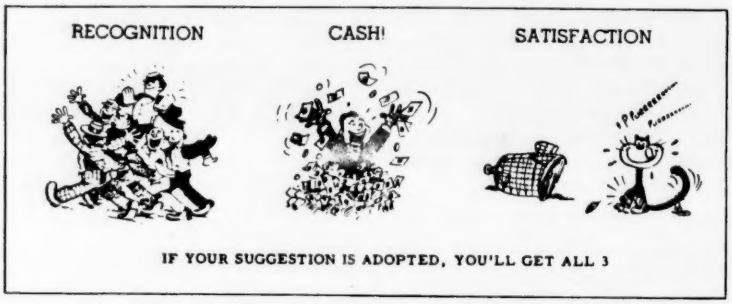
so I gave him brandy, but he simply did not have the will to live. On the twenty fourth day he showed further signs of weakness and despair, refusing to eat anything, so I had to spoon-feed him on brandy and water, with a paste of biscuits and chocolates. The morale of the remainder of the men was quite good, on the whole, but they require an occasional lecture on the subject of not giving up hope. at 1700 on the twenty seventh day Ordinary Seaman____died". "The remaining eleven men were rescued on the following day".

Sailing boat. Indian Ocean.

About the 60th day, C.O. Jennings reported "Logic was the standard by which we measured our decreasing reserve of energy; to climb from my bed into the tiller cockpit required a tremendous effort of will-power, but the reverse direction was comparatively easy because the watch was over and I savoured the thought of rolling up into my blanket with the hope of glorious oblivion".

Resolve to hang on to life and never give up hope of rescue. Many men who have succumbed at sea would have been rescued if they had held on for just another day.

Editor's Note: *The above accounts were reprinted with permission from the International Radio-Medical Centre (CIRM). They are actual cases of men who survived great hardship by; "THE WILL TO LIVE".*



A FEW WORDS ABOUT CATENARY IN A TOW LINE By CWO R. V. ALRED, USCG

During the course of a normal towing operations, the hawser leads aft to the tow not taut like a "Dixie Hat Band", but rather with a dip. This dip is called "catenary" See Figure 1.

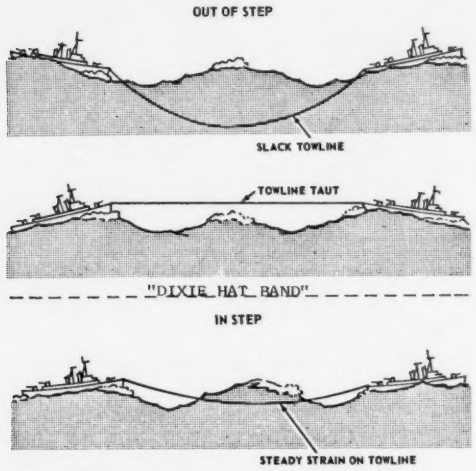


Figure 1 . — Proper catenary for towing.

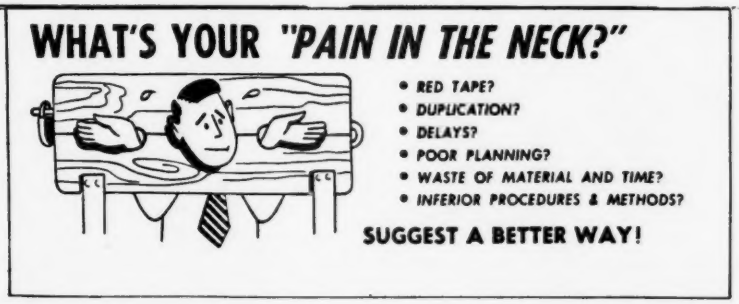
Catenary serves an important function:

It provides reserve line that comes into play during surging of the tow, preventing the hawser from coming up short and taut and thereby reducing strain on the hawser, tow, and towing vessel.

Breaking surf or heavy following seas can exert a severe strain on the towing gear. This is caused by the tendency of the vessel towed to surf as a large sea lifts her stern. This causes the towing vessel to gain way when the strain eases.

As the wave overtakes the tow and the tow stops surfing, the slack is taken up by the towing vessel. This causes the towing hawser to become taut and creates an undue strain, which the hawser transmits to the towed vessel. This strain can lead to capsizing.

Remember, set your tow so you "both are in step"; that is, you are both on the crest of the swell at the same time. See Figure 1 again. Keep in mind, as you tow closer to shore, the swells will get closer together and result in your "getting out of step". If this occurs, pay out slack when the hawser is not under a heavy strain. This will get your tow "back in step".



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